REMARKS

Claims 1- 3, 5 - 7 and 9 - 16 remain active in this application. Claims 4 and 8 have previously been canceled. Claims 11 - 16 have been withdrawn from consideration as being non-elected, without traverse, in response to a requirement for restriction. The specification has been reviewed and editorial revisions made where seen to be appropriate. Claim 1 has been amended to more fully clarify the location of the liner. Support for the amendments of the claims is found throughout the application, particularly in Figures 1 and 2 and the description thereof on pages 9 through 12. No new matter has been introduced into the application.

Claims 1 and 5 have been rejected under 35 U.S.C. §102 as being anticipated by Colgan et al.; claims 2 and 6 have been rejected under 35 U.S.C. §103 as being unpatentable over Colgan et al. and Barth et al.; Claims 3 and 7 have been rejected under 35 U.S.C. §103 as being unpatentable over Colgan et al. in view of Tobben et al.; and claims 9 and 10 have been rejected under 35 U.S.C. §103 as being unpatentable over Colgan et al. in view of Jain et al. These grounds of rejection are respectfully traversed for the reasons of record and the further remarks provided below, especially since the references relied upon and Colgan et al., in particular, do not contain the teachings or suggestions the Examiner attributes to them.

It is respectfully submitted that the manner in which the Examiner seeks to apply Colgan et al. is unclear from the statement of the rejection and that any manner in which Colgan et al. can be reasonably be construed falls far short of answering the recitations of the claims. That is, to answer the "liner" recitation of claim 1, the Examiner merely refers to column 4, lines 23 - 27 having noted columns 1 and 2 in

regard to the "stud" recitation of claim 1. Columns 1 and 2 form the "Background" section of Colgan et al. while column 4 discusses the embodiment of Figure 1. As discussed therein element 15 is a semiconductor substrate, layers 20 and 22 are of insulator, regions 16 and 17 are "contact regions" of "for example, titanium silicide" (column 4, lines 15 and 16) which, as illustrated are formed in openings in insulator layer 20, while studs 24 and 25 are formed by filling openings in insulator layer 22 with metallization which may be tungsten, as noted in line 26 within the passage cited by the Examiner in regard to the "*liner*" recitation. Above this structure and surface 23, element 30 is in interconnect which may be copper, layer 34 is an insulator and studs 36 formed in openings therein are CuAl alloy studs.

Column 4, lines 23 - 27, clearly is directed to the formation of studs 24, 25 by forming openings in insulation layer 22 and filling the openings with metallization, which may be tungsten, "to make ohmic contact with contact regions 16 and 17". Therefore, it seems clear from the references to insulation layer 22 and "contact" with contact regions 16 and 17 as well and contact regions being a silicide (formed by allowing deposited metal with underlying semiconductor) that the metallization referred to is that of the studs rather than any structure which could answer the liner recitation for which the passage is cited by the Examiner.

In view of the Examiner's reference, it seems reasonable to conclude that the Examiner is reading the "stud" recitation of claim 1 on studs 24 and 25 of Colgan et al. However, even if this is the case, it is unclear if the Examiner is reading the "liner" recitation on contact regions 16 and 17, in which case, there is no copper layer under the liner but only the silicon substrate (or a semiconductor structure formed

therein) or if the Examiner is suggesting that contact regions 16 and 17 could be copper in view of the phrase "for example", noted above, that suggestion would clearly be an exercise in impermissible hindsight and, moreover, there would be no structure corresponding to the "liner" recitation. If, on the other hand (although it seems unlikely), the Examiner is seeking to read contact regions 16 and 17 on the "stud" recitation of claim 1, there is no structure in Colgan et al. which would correspond to *either* the copper layer or the liner. The claimed structure cannot be read on the structure above surface 23 since, while it includes a copper interconnect structure 30, the studs 12 are a CuAl alloy and there is no structure corresponding to the recited liner, nor is there any need for any as an incident of tungsten processing. Proceeding upward in Colgan et al., layer 66 is an adhesion layer and there is no need for it to function as a barrier since interconnect 67 is also a CuAl alloy (column 6, lines 36 - 51). Therefore, under any evident construction of Colgan et al. which the Examiner may be seeking to express, it seems clear that Colgan et al. does not anticipate any claim in the application and the statement of the rejection indicates substantial confusion of the Examiner as to the nature of the claimed subject matter defining the invention.

Specifically, at best, Colgan et al. may teach the use of a tungsten stud as a barrier to copper and aluminum migration in a copper layer *formed subsequent to* and above the tungsten stud, it has nothing to do with and does not address the issue of damage to an *existing* copper layer during formation of a stud, particularly by the formation of a *liner in an opening in an insulator* in which the stud is formed, as claimed. The Examiner appears to have confused the function of the barrier as well as the structure in

regard to the liner and the stud as well having given, possibly for that reason, substantially no weight to the structural relationship between the copper layer, the tungsten studs, the liner and the aluminum layer as recited in the claim. Accordingly, no *prima facie* demonstration of anticipation of any claim has been made (or can be made) by the Examiner based on Colgan et al. Therefore, reconsideration and withdrawal of the rejection of claims 1 and 5 is respectfully requested.

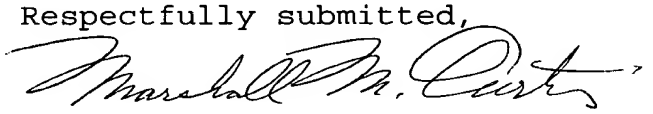
The failure of Barth et al, Tobben et al. and/or Jain et al. to supplement Colgan et al. at any of these points of deficiency to answer the recitations of the claims is discussed in the previous response and is hereby fully incorporated herein by reference. However, in response to the Examiner's comments in the Advisory Action of July 7, 2003, it is respectfully submitted that the environment (connections to capacitor plates) of Barth et al. is, indeed relevant to the issue of obviousness since a structure of conductive plates functioning as a capacitor *element* must necessarily be larger than the minimum feature size having only parasitic capacitance and the problem of forming a transition structure between copper and aluminum metallurgies at minimum feature size is not presented. Therefore, Barth et al. cannot lead to an expectation of success in achieving a copper to aluminum transition structure at minimum feature size or at interconnect line size and pitch with a tungsten stud while avoiding damage to copper from the tungsten processing and thus cannot provide evidence of a level of ordinary skill in the art which would support a conclusion of obviousness or even provide motivation for modification of Colgan et al. Accordingly, it is again respectfully submitted that the rejections for obviousness based on Barth et al., Tobben et al. and/or Jain et al. are in error and the Examiner has not made

a *prima facie* demonstration of obviousness of any claim in the application. Therefore, reconsideration and withdrawal of the rejections of claims 2 -3, 5 - 7, 9 and 10 are respectfully requested.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account No. 09-0458 of International Business Machines Corporation (E. Fishkill).

Respectfully submitted,



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